SUSPENSION FOR LOAD HOOKS

BACKGROUND OF THE INVENTION

The invention concerns a suspension for load hooks, especially for lower blocks of cable actuators, with a shaft able to turn about a vertical axis in a recess of a carrier body, being mounted in a continuous bore of a supporting element and abutting against the carrier body across at least one axial bearing.

Suspensions for load hooks are known from practice in the most diverse configurations. From DIN 15 411, there is known a lower block with two cable rollers, in which the load hook can turn about a vertical and a horizontal axis and is mounted on a load hook suspension, which is arranged underneath the connection body which carries the cable rollers. Because of the use of the connection body, on the one hand, and the separate load hook suspension, on the other, this familiar design has a relatively large structural height and, moreover, a lot of structural parts.

A generic load hook suspension is known from German Patent No. DE 196 02 931 C2. In this suspension, the shaft of the load hook is mounted in a recess of the connection body, carrying the cable rollers, of a lower block. The axial bearing installed in the recess and supporting the shaft of the load hook is held in the recess by tangentially arranged screws, which are screwed into tangential grooves of the bearing retainer from the cable rollers. Because of this tangential screw fastening of the axial bearing in the recess, the assembly process for this known suspension is very cumbersome and requires an exact positioning of the bearing retainer with the load hook mounted therein in the recess of the connection body, since the tangential screws can only be screwed in one position into the tangential grooves of the bearing retainer.

Another suspension for load hooks is known from German patent application No. DE 198 17 011 A1. In this known load hook suspension for a lower block, the load hook can turn about both a vertical and also a horizontal axis. For this, the bearing arrangement for the shaft of the load hook, arranged in the recess of the connection body carrying the cable rollers, comprises the axial bearing for the rotation about the vertical axis and also a cylindrical journal, which is mounted in the connection body so that it can turn and which spans the recess. To accommodate the shaft of the load hook, the cylindrical journal has a continuous bore. A nut is

screwed onto the free end of the load hook shaft, protruding from the continuous bore, and the load hook is thus secured on the cylindrical journal. Due to the use of the cylindrical journal, the overall bearing arrangement has a relatively large structural height and, furthermore, consists of many parts not capable of preassembly.

SUMMARY OF THE INVENTION

Based on the foregoing, the problem of the invention is to create a short and simple design for a load hook suspension.

The solution of this problem is characterized, according to an aspect of the invention, in that the shaft of the load hook is mounted in the carrier body by a bearing arrangement consisting of the support element, at least one axial bearing, and the retaining ring surrounding the shaft. The bearing arrangement is fastened by a securing element, preferably the retaining ring, in the carrier body.

The bearing system of the invention makes it possible to preassemble the entire bearing arrangement before being installed in the recess of the carrier body. Furthermore, only one fastener element, such as a snap-ring, is required to secure the bearing arrangement in the recess. The assembly is thus easy and fast, especially since it does not require any particular positioning of the bearing arrangement relative to the carrier body and/or the recess.

The fastening element for securing the bearing arrangement may reach around an undercut of the carrier body, on the one hand, and thrusts against a bearing surface of the retainer ring, on the other. The overall bearing arrangement in this embodiment is mounted on the fastener element, which is supported against the carrier body. Advantageously, the undercut to accommodate the fastening element is in the form of a peripheral annular groove in the carrier body.

The securing of the load hook shaft on the support element, according to one preferred embodiment of the invention, occurs by way of a securing element, especially a snap-ring, which, in the assembled state, engages with an undercut at the free end of the shaft, on the one hand, and is arranged in a recess of the support element, on the other.

In a first practical embodiment, the undercut to accommodate the securing element is in the form of a peripheral annular groove in the load hook shaft.

In order to reduce the notch stresses which occur, according to a second embodiment, it is proposed that the undercut to accommodate the securing element

is in the form of a tapering of the shaft cross section that progresses from the free end of the shaft.

Advantageously, the surface of the supporting element facing the axial bearing and/or the surface of the retaining ring is fashioned as a planar bearing surface for the axial bearing, which is fashioned in particular as an axial needle roller bearing.

According to an alternative embodiment of the invention, the support element itself forms the upper bearing shell of the axial bearing, which can further reduce the number of parts.

With a preferred modification of the invention, it is proposed that the load hook is mounted so that it can swivel about a horizontal axis in the carrier body, in addition to being able to rotate about the vertical axis. Due to this additional degree of freedom, the handling and possible use of a load hook mounted according to the invention can be substantially improved. This ability to swivel about a horizontal axis is advantageously achieved by two cylindrical rollers, arranged between the lower shell of the axial bearing and the retaining ring, forming the horizontal swivel axis, with the cylindrical rollers being arranged opposite each other on both sides of the shaft of the load hook in the bearing arrangement.

The number of structural parts needed to form the bearing arrangement of the invention can be further reduced in that the cylindrical rollers are arranged between the retaining ring and a swivel bearing ring encircling the shaft and forming the lower shell of the axial bearing.

The swiveling about the horizontal axis can be facilitated, and also limited in the angle of swivel, in that, first, a gap is formed between the facing surfaces of the retaining ring and the swivel bearing ring in a plane perpendicular to the swivel axis, and, secondly, the side walls of the continuous bore of the retaining ring are conically enlarged in the direction of the load hook, at least in the swivel plane of the load hook.

The limiting of the swivel angle is made possible in that the facing surfaces of the retaining ring and the swivel bearing ring and/or the conical sidewalls of the continuous bore of the retaining ring form stopping surfaces limiting the angle of swivel of the load hook. The gap between the facing surfaces of the retaining ring and the swivel-bearing ring is advantageously configured to widen in the radially outward direction.

Finally, the invention proposes that the handling of the device provided with the load hook is facilitated by at least one recessed handle in the carrier body. The carrier body provided with at least one recessed handle, configured for example as a connection body for a lower block, can be easily and cheaply fabricated as a cast iron piece, whereas a forged load hook provided with a recessed handle, as is known from the state of the art, constitutes a costly and difficult to fabricate special part.

Further features and advantages of the invention result from the enclosed drawings, in which two sample embodiments of an invented suspension for load hooks are represented only in sample fashion.

These and other objects, advantages and features of this invention will become apparent upon review of the following specification in conjunction with the drawings.

BRIEF DESCRIPTION OF THE DRAWINGS

Figure 1 is a partial cutaway front view of a load hook suspension arranged on a lower block according to a first embodiment of the invention;

Figure 2 is a sectional view taken along line II-II of figure 1;

Figure 3 is a partial cutaway front view of a load hook suspension arranged on a lower block according to a second embodiment of the invention;

Figure 4 is a sectional view taken along line IV-IV of figure 3; and

Figure 5 is the same view as figure 4, but showing the load hook in a swiveled position.

DETAILED DESCRIPTION OF THE PREFERRED EMBODIMENT

Referring now to the drawings and the illustrative embodiments depicted therein, the representations of figures 1 through 5 show two sample embodiments for the configuration of the suspension of a load hook 1, which is mounted in a recess 2 of a carrier body 3. In the sample embodiments depicted, the carrier body 3 is configured as a connection body carrying two cable rollers 4 of a lower block 5.

As is evident from the figures, a bearing arrangement 6 forming the suspension of the load hook 1 may include at least one annular support element 7, an axial bearing 8, as well as a retaining ring 10, encircling a shaft 9 of the load hook 1, wherein the load hook 1 is able to turn about a vertical axis 11 due to the use of the axial bearing 8. The overall bearing arrangement 6 mounted in the recess 2 of the carrier body 3 is held in the recess 2 of the carrier body 3 by a securing element 12.

This securing element 12, as represented in figures 1 through 5, can be embodied, for example, as a snap-ring, which engages with an undercut 13, especially an annular groove, in the carrier body 3.

In the first embodiment represented by figures 1 and 2, the load hook 1 is mounted in the carrier body 3 so as to rotate only about the vertical axis 11. In this embodiment, both the support element 7 and the retaining ring 10 have planar bearing surfaces 7a, 10a for the mounting of the axial bearing 8, against which the shells of the axial bearing thrust.

The fastening of the shaft 9 of the load hook 1 occurs by a securing element 14, such as a snap-ring, which in the assembled condition engages with an undercut at the free end of the shaft 9, on the one hand, and is arranged in an indentation 16 of the support element 7, on the other hand. This construction has the benefit of allowing an especially short height for the bearing arrangement 6, since the free end of the shaft 9 only protrudes slightly beyond the upper edge of the support element 7. In the representation of figure 1, two embodiments are shown for configuring the undercut 15 to accommodate the securing element 14 on the shaft 9, although in practice, of course, only one embodiment will be used in one bearing arrangement 6.

On the right side half of the shaft 9, the undercut 15 receiving the securing element 14 is configured as a peripheral annular groove 15a, while the undercut 15 on the left half of the shaft 9 is configured as a tapering 15b of the cross section of the shaft. The tapering form 15b has the advantage that fewer notch stresses occur as compared to the peripheral groove 15a.

The cutaway side view per figure 2 reveals that recessed handles 17 are fashioned in the carrier body 3 to facilitate the handling. The forming of the recessed handle 17 on the carrier body 3 is especially advantageous, since a carrier body 3 provided with recessed handles 17 can be easily and cheaply produced as a cast iron part, while a forged load hook 1 provided with recessed handles 17, as is known from the state of the art, is a costly and difficult to produce special part.

The second embodiment represented in figures 3 through 5 for the configuring of the suspension of a load hook 1 differs from the previously described embodiment essentially in that the load hook 1 is mounted in the carrier body 3 able to swivel about a horizontal axis 18, in addition to being able to turn about the vertical axis 11.

For this purpose, two cylindrical rollers 19 are arranged between the lower shell of the axial bearing 8 and the retaining ring 10, forming the horizontal swivel axis 18, and the cylindrical rollers 19 are arranged opposite each other on both sides of the shaft 9 of the load hook 1 in the bearing arrangement 6.

In the embodiment depicted, the cylindrical rollers 19 are arranged between the retaining ring 10 and a swivel-bearing ring 20 encircling the shaft 9 and forming the lower shell of the axial bearing 8. As is further evident from these figures, the support element 7, on the one hand, and the swivel bearing ring 20, on the other, form the shells of the axial bearing 8, whereas in the embodiment per figures 1 and 2, the axial bearing 8 had only one retainer proper.

In figures 4 and 5, one will discern a specific configuration for the swivel bearing ring 20 and the retaining ring 10, whereby the load hook 1 can be easily swiveled about the axis 18, on the one hand, but also the angle of swivel can be limited, on the other hand.

As can be seen from figures 4 and 5, a gap 21 is formed between the facing surfaces 10a, 20a of the retaining ring 10 and the swivel bearing ring 20 in a plane perpendicular to the swivel axis 18, enabling the two parts 10 and 20 to swivel relative to each other. The swivel angle of the load hook 1 can be adjusted in that the gap 21 is configured to widen in the radially outward direction. This outwardly broadening gap 21 can be produced in that, as represented in figures 4 and 5, the bearing surface 20a of the swivel-bearing ring 20 is sloping relative to the bearing surface 10a of the retaining ring 10. Of course, it is also possible to make only the bearing surface 10a of the retaining ring 10 slanted relative to the bearing surface 20a of the swivel bearing ring 20, or to make both bearing surfaces 10a, 20a slanted.

Furthermore, side walls 10b are conically widened in the direction of the load hook 1, at least in the swivel plane of the load hook 1, in order to allow for the swiveling of the load hook 1.

The facing bearing surfaces 10a, 20a of the retaining ring 10 and the swivel-bearing ring 20 and/or the conical sidewalls 10b of the retaining ring 10 thus form stopping surfaces, which limit the angle of swivel of the load, hook 1.

Such suspensions for load hooks 1 are distinguished by their compact construction with short structural height, on the one hand, and possess the advantage that the entire bearing arrangement 6 can be preassembled outside of the carrier body 3, on the other hand. For the actual assembly on the carrier body 3, it is only

necessary to install the bearing arrangement 6, previously assembled on the shaft 9 of the load hook 1, into the recess 2 in the carrier body 3 and fasten the bearing arrangement 6 to the carrier body 3 by the securing element 12.